INDUSTRIAL DEVELOPMENT IN THE EASTERN ARCTIC STUDY AREA: A PRELIMINARY OVERVIEW

by

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EXECUTIVE SUMMARY

Some difficult and complex problems face Inuit leaders, government officials, and business executives as new arrangements for industrial development are worked out in the course of land claim negotiations and their aftermath. The resulting decisions will determine the pace and direction of the northern economy for many years to come. The challenge that must be met is to capture the maximum practicable benefit for the local people, and for Canada, while preserving adequate financial incentives for investment.

Industrial activities of particular significance to the Eastern Arctic Study include the exploration, production, processing, and transportation of non-renewable resource materials. The materials to be considered include both hard minerals and petroleum hydrocarbons. Industries such as tourism, government service, wholesale and retail trade, handicrafts, and other light manufacturing are not included.

Industrial activities, as defined here, are relatively well established in the Yukon and western NWT, and account for a major share of all economic activity. In the eastern Arctic, however, industrial development is still largely a future prospect. One mine is currently operating and two more are under construction. Active exploration programs are underway for precious metals, nonferrous metals, uranium, oil and gas. Major proposals for the transportation of metal concentrates, crude oil, and natural gas are being studied.

A preliminary review of these existing and potential developments reveals a high level of exploration activity in almost every region of the ITC claim area. Substantial production of hard minerals and petroleum could well follow. Processing of these materials in the north will be minimal for the foreseeable future.

Transportation impacts may well be more substantial than those of other types of activity . The transport of nonferrous metal concentrates, precious metal products, and uranium output may have local implications. But the transport of oil and gas on a year-round basis may affect many communities.

Issues requiring study and resolution in the process of land claim negotiation and development of new political institutions include:

- Motivations for and expectations of industrial development;
- Impact of industrial development;
- Design of particular projects;
- Regulatory process and structure;
- Resource revenues;
- Local participation in resource development;
- Implications for development decisions.

CONTENTS

Acknowledgements / ii

Executive Summary / iii

1. Introduction / 1
    Definition of Industrial Development / 2

2. Background / 5
    The Policy Environment / 6
    The Market Environment / 7
    Regulatory Arrangements / 7

3. Existing and Potential Industrial Developments / 9
    Precious Metals / 9
    Nonferrous Metals / 10
    Uranium / 11
    Petroleum / 12
    Mineral Processing / 13
    Mineral Transportation / 14

4. Industrial Development Issues / 19
    Motivations for Northern Development / 19
    Impact of Industrial Development / 19
    Design of the Industrial Development / 20
    Regulatory Process and Structure / 20
    Resource Revenues / 21
    Participation by Local People in Resource Development / 21
    Implications for Development Decisions / 22

Appendix I: Industrial Developments: Location / 25
Appendix II: Industry/Community Interactions / 27

The Author / 29

Eastern Arctic Study / 31

1. INTRODUCTION

It has been correctly said that perceptions of the north vary widely between individual Canadians. Nowhere is this more true than in relation to industrial development. For some, the north represents the last frontier, a storehouse of mineral wealth waiting to be unlocked for the benefit of the majority. For others, it is a beloved homeland, providing a way of life that must be preserved and protected against rapid change.

Decisions as to the future of industrial development in the north are therefore among the most important that must be faced by Inuit leaders, government officials, and business executives as they work out the new accommodations which will result from the land claim and changes in local governance.

On the one hand, industrialization undoubtedly has the potential for radically changing the lifestyle of the Inuit. The potential changes contain the seeds of both benefits and dangers. Some native northerners will welcome opportunities for employment and for the establishment of a predominantly wage-related economy. Others will be concerned about potential damage to wildlife stocks and other features of the natural environment, leading to a decline in opportunities for traditional hunting pursuits. Some will also fear the possibility of social disintegration in the community. Most will agree that the process of industrial development must be carefully and wisely managed if the benefits are to outweigh the costs in the long run.

Great changes have already occurred in the Inuit lifestyle in the last generation. It is a tribute to the adaptability of the people that the consequences have not been more severe. The present process of land claim negotiation and political evolution may be viewed as an attempt to shape the future into a pattern that preserves the most important facets of Inuit life while permitting continued evolution of economic and political institutions.

On the other hand, it must be recognized that the results of this evolutionary process will vitally affect the pace and direction of industrial development. The specific provisions which are enshrined in any particular land claim settlement may greatly alter the desirability of the north in the eyes of industrial developers. For this reason, it is essential that northern people have the ability to predict the implications of their requests as they affect potential industrial development. The mutual dependency which exists between the Inuit and industrial developers makes a careful and cooperative approach imperative.

One of the purposes of the Eastern Arctic Study is to anticipate difficulties which may arise in the course of land claim settlements, and to mitigate their effects. We hope to assist in the vital process of mutual understanding by providing an independent source of information and analysis.

Our approach is based on certain assumptions. We believe that northern energy and mineral resources can make an important contribution to the welfare of all Canadians. As a result, there will be continued pressure, and continued economic incentives, for industrial development in the north. We believe that the nature of the land claim settlement and the resulting structures and processes of local government will have a profound influence on the type of development that occurs. We believe that it is in the long-term interests of industrial developers to understand the motivations and desires of the native people, and we believe that most potential developers wish to satisfy these needs as much as possible. Conversely, we believe that a large number of the northern people favour industrial development, trusting that it can provide material benefits, and that the potential difficulties can be controlled by appropriate regulatory means.

This preliminary paper will sketch out some of the salient features of industrial development as it exists and as it is projected for the near future. It will attempt to relate potential developments to their effect on particular communities, and it will attempt to pose some of the issues that need to be considered in evaluating the mutual dependency of interests which has been identified.

Definition of Industrial Development

For the purposes of the Eastern Arctic Study we define industrial development primarily as those organized activities connected with the use of nonrenewable resources. We therefore include the exploration, production, processing, and transportation of hard minerals and of oil and gas. Other industries, such as the harvesting of wildlife and renewable resources, tourism, wholesale and retail trade, government service, handicrafts, and other light manufacturing are excluded.

In choosing this definition of industry, we do not intend to minimize the importance of the excluded industries, but rather to highlight those which typically require a large scale of operation and are most closely integrated with the national economy. Mining and petroleum are industries in which there is already a significant history of production in the north and in which there

is considerable potential for the future. Moreover, these industries represent a form of organization and work which represents a distinct change from the non-wage economy previously existing. Both industries are capital-intensive and both require a high degree of technologic sophistication. Both call for complex organizations and represent a major departure from traditional activities.

The past contribution of mining and petroleum to the northern economy is well recognized. In recent years the mineral industry, broadly defined, provided 40 percent of all wage employment in the Yukon and Northwest Territories. The contribution of minerals to census value added in the two northern territories was even more impressive, accounting for a full 85 percent of value added in all goods-producing industry in 1977. We do not wish to overstate the importance of these statistics, recognizing that important elements of the traditional non-wage economy are omitted. Nevertheless, the industrial activities we propose to evaluate <u>are</u> extremely significant. We believe that the relative importance of the mineral industries will continue to be very great in the north.

At the same time, the two industries being considered are international in scope. They are rather sensitive to the financial attractiveness of northern Canada as compared to other potential investment environments. We therefore consider them appropriate indicators of the implications of land claim provisions.

As will be seen from the brief survey which follows in chapter 4, potential developments of both mining and petroleum are well represented in the Inuit Tapirisat of Canada (ITC) claim area.

2. BACKGROUND

As indicated, both the Yukon Territory and the Northwest Territories have been particularly dependent upon minerals for their industrial development to date. While the statistics quoted above are necessarily aggregated for both federally-administered territories, it will be useful here to focus on the NWT and, more specifically, on the ITC claim area.

There are currently seven mines operating in the NWT. Both Giant Yellowknife Mines Limited and Cominco Limited operate gold-silver mines in the Yellowknife area. Near Great Bear Lake, Terra Mining and Exploration Limited operates a copper-silver-bismuth mine at Camsell River, while Echo Bay Mines Limited has a copper-silver mine at Port Radium. Canada Tungsten Mining Corp. Ltd. operates its tungsten mine in the Flat River Valley on the Yukon border. Finally, there are two lead-zinc mines: Pine Point Mines Ltd. has a large mine, comprising eight open pits, on the south shore of Great Slave Lake, fifty miles east of Hay River. As well, Nanisivik Mines Ltd. operates an underground silver-lead-zinc-cadmium mine at Strathcona Sound on northern Baffin Island. Production at Nanisivik commenced in October 1976.

Turning to mineral fuels, natural gas is produced at the Pointed Mountain field in the extreme south-west corner of the NWT, to be processed at Fort Nelson, British Columbia. Petroleum is produced and refined by Imperial Oil Limited at Norman Wells on the Mackenzie River.

Of all these producing mineral developments, only one, Nanisivik, is in the ITC claim area. A second, and larger, zinc-lead mine is under construction at the Polaris deposit on Little Cornwallis Island. A nickel mine was operated at Rankin Inlet from 1956 until 1962, since which time it has been idle.

This short catalogue indicates that mineral production to date in the eastern Arctic is somewhat less developed than it is in the Yukon and the western part of the NWT. However, in addition to the operating ventures which have been mentioned, a number of exploration projects, both for oil and gas and for hard minerals, have been active. These will be detailed in the next chapter. Suffice it to say here, however, that the prospects for hydrocarbon development, and for uranium and other mining, are very substantial. For this reason, it is particularly important to arrive at a common understanding of the development process and its implications as soon as possible.

The Policy Environment

It may be useful briefly to recapitulate the evolution of northern mineral development policy over the past several years. These policies have been rather changeable, at certain times being favourable to northern industrial development, at others, less so.

The period to the end of World War II saw a laissez-faire attitude toward northern development. Private enterprise determined which resources would be exploited, and government restricted itself to provision of a few essential services. Into the 1950s there was some public investment (in transportation facilities, for example), but only where private investment led, and this required commercial feasibility. The Diefenbaker 'northern vision' of the late 1950s brought about a fundamental change: henceforth, through programs such as 'Roads to Resources', public investment in infrastructure would lead private investment, thereby promoting faster resource development.

Up to this point, growth was considered to be justified for the benefits it brought in the form of raw materials for southern Canadian industry, direct and indirect employment, secondary efforts such as an improved balance of trade, and support for sovereignty over northern Canada.

During the decade of the 1960s, however, government objectives other than economic development began to emerge. Efforts were made to maximize the regional benefits, and minimize the adverse impacts, of northern development. The 1972 policy statement by Jean Chrétien, then Minister of Indian Affairs and Northern Development, placed priority on achieving a 'higher standard of living . . . for northern residents by methods which are compatible with their own preferences and aspirations.' The attitudinal switch from development of the north to development for the north was carried further in a 1978 speech by Hugh Faulkner, then Minister of Indian Affairs and Northern Development, which emphasized concern with the resolution of social, environmental, and political problems in the north, rather than with economic growth.

At the same time, since 1973 the process of native land claims has acquired a parallel significance. Quite naturally, a number of native groups have preferred to defer industrial development until land claims are settled, or alternatively until local communities and authorities could exert more influence over the nature of the development.

The Market Environment

Just as the policy environment has been changeable, so has the market for mineral commodities. Everyone is familiar with the rapid escalation of energy prices since late 1973. This price increase, combined with declining production from conventional Canadian petroleum sources, has made the Arctic deposits more attractive. As a result, drilling activity in the Beaufort Sea and in the Arctic Islands has accelerated.

Market conditions for hard minerals have shown more variety. The price of gold has fluctuated wildly during the late 1970s and early 1980s, but has remained well above the artificially low values that obtained prior to the mid-1970s. This dramatic increase has led to renewed interest in gold mining in the north, and has produced both new mines (e.g. Cullaton Lake) and expansions at existing mines. Base metal prices have fluctuated also, reaching temporary peaks in 1974 and again in 1979. On both occasions prolonged market strength was anticipated, but it did not materialize. Nevertheless, there is expected to be a steady requirement for expanded output of lead, zinc and copper for at least the next twenty years. At any given time, however, the attractiveness of developing any particular deposit will depend critically on world demand for the product and the relative levels of prices and costs.

Uranium is a case in point. Following the 1973/74 price increase for petroleum, the apparent demand for uranium reached unprecedented proportions, as electric utilities all over the world scrambled to secure supplies for the future. Exploration activity increased dramatically as a result. A number of important finds were made in the NWT, as well as in Saskatchewan and in other countries such as Australia. Meanwhile, petroleum prices have stabilized to some extent in real terms, and a number of factors have combined to limit the demand for nuclear power. As a result, markets for uranium have weakened, and prices have declined dramatically. Whereas some of the uranium deposits which have been discovered are still highly attractive, others have probably become marginal.

No doubt future cycles in demand and commodity prices will result in heightened pressure for development of northern mineral resources. It will be highly desirable if the necessary accommodations can be reached in the interim.

Regulatory Arrangements

The traditional arrangement, whereby mineral permits, leases, and conditions were administered by the federal government, has given way to a mixed system in

which some of the matters have been delegated to regional offices of the Department of Indian Affairs and Northern Development, and others delegated to the Territorial Government.

The further evolution of constitutional change in the territories, both in connection with the ITC land claim and independently of the claim, are discussed in some detail in a companion paper.[1] It is probably sufficient to note here that continued change is in prospect. Local communities will wish to exert a substantial influence on the direction of development to protect the facets of daily life which they consider most important. At the same time, it will be recognized that the regulatory environment is a matter of considerable importance to the potential developer. There are grounds for believing that necessary regulations, consistently applied, will be acceptable to industrial developers, and that in many cases, development can proceed in harmony with the needs of the community.

The prospect of a changed regulatory environment, however, does raise certain issues for the community as well as the developer, and these must be addressed. The last section in the paper discusses a number of these issues briefly.

Before turning to those issues, it will be useful to provide a brief factual description of the existing and potential industrial activities in the ITC claim area.

1. Katherine A. Graham and Anne B. McAllister, The Inuit Land Claim, Constitutional Development, and Local Government Reform in the Northwest Territories: An Overview. A working paper for the Eastern Arctic Study (Kingston: Institute for Local Government and the Centre for Resource Studies, Queen's University, 1981).

3. EXISTING AND POTENTIAL INDUSTRIAL DEVELOPMENTS

In this section only those ventures affecting Inuit people primarily are discussed. The list of exploration and production projects is organized along commodity lines, with the various classes of hard minerals being discussed first, followed by petroleum. There follows a brief discussion of the potential for processing of hard minerals and petroleum. A section on the transportation of all these commodities concludes the chapter.

The approximate boundaries of the ITC claim area are shown on figure 1, appendix I. The various industrial projects are also shown, with their approximate location indicated by numbered circles. Transportation routes are indicated by broken lines, numbered with square symbols.

Appendix II contains a table which relates various industrial developments to nearby communities. The potential for impact in individual communities may be deduced in an approximate way from the number and nature of industrial activities in the neighborhood.

Precious Metals

Cullaton Lake Gold Mines Ltd. is undertaking full underground development of its gold property 250 miles north-west of Churchill (1).[2] The nearest NWT community is Eskimo Point. Potentially the highest-grade gold mine in Canada, Cullaton Lake will produce at the rate of 200 tons of ore per day for six months of the year beginning in the summer of 1981. A major innovation is that financing is being provided in part by the Inuit Development Corporation (IDC), which will lend $20 million to the company. In addition to commercial interest payments, the IDC will receive 100 thousand shares as a bonus, with an option to purchase a further 400 thousand shares.

Near the boundary of the ITC claim, at Contwoyto Lake, Echo Bay Mines Ltd. has completed a major program of underground exploration and development on its Lupin gold property (2). The mine is expected to come into production late in 1982. The nearest community is at Bathurst Inlet.

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2. Throughout this section the numbers in parentheses refer to the locations identified by the same numbers in figure 1, appendix I.

Nonferrous Metals

Nanisivik Mines Limited operates an underground silver-lead-zinc-cadmium mine at Strathcona Sound on northern Baffin Island, 18 miles north-east of Arctic Bay (3). This is the only operating mine in the ITC claim area at present. The mine is equipped to mill 2,000 tons per day of ore, and reached capacity production in 1979. Early in 1980 production was interrupted by the settling of the concentrator building due to the melting of permafrost. In 1978, there were 218 employees, of whom 43 were Inuit. A new town site has been constructed near the mine.

The Polaris deposit is being developed by Cominco on Little Cornwallis Island, 60 miles north-west of Resolute (4). This will be the world's most northerly mine. Production is expected to commence early in 1982. Mill capacity will be 2,200 tons per day and is expected to continue for more than 20 years. Polaris will be the eleventh largest lead-zinc mine in the world. The work force will be a mixture of southern residents and native people, the latter being drawn from Resolute and several other communities. IDC is handling the recruiting for Polaris on a contract basis.

Two further base-metal areas have attracted exploration activity in the past two years. The first is the northeastern Mackenzie district. Cominco Limited announced that it would spend $400 thousand drilling on the Hackett River base metal property of Bathurst Norsemines during the summer of 1980 (5). This property lies to the south of Bathurst Inlet. The future development of any base-metal prospects in this area, including the previously-discovered Izok Lake deposit of Texasgulf (6) will depend on the establishment of transportation facilities.

The second area of interest lies in the southern Keewatin and in the Ennadai volcanic belt. Three companies have been active. Gulf Minerals completed ground geophysical and diamond drilling surveys on their copper-zinc deposit near Ennadai Lake (7). St. Joseph Explorations completed ground geophysical surveys on their Heninga Lake copper-zinc deposits. Esso Minerals completed geophysical surveys on their copper-nickel deposit at Ferguson Lake (8). No public information is available at present as to the likelihood of development of any of these deposits.

In addition to these operating and potential mines, a nickel mine did operate for six years near Rankin Inlet. North Rankin Nickel Mines Ltd. closed its operation in 1962, when mineable ore was exhausted. Before closure, some 49,000 tons of ore were mined, grading 2.5 percent nickel and 0.7 percent

copper. Concentrates were shipped to the Sherritt Gordon nickel refinery at Fort Saskatchewan, Alberta.

Uranium

In the mid-1970s the burgeoning price of uranium and the success of new geological concepts led to a virtual uranium rush in Saskatchewan and the NWT. Within the ITC claim area there are three major zones of uranium exploration as well as smaller, more isolated sites.

A major focus of activity has been in the region surrounding Baker Lake and Dubawnt Lake. In addition there is a pocket of uranium exploration activity around Bathurst Inlet and another near Coppermine. Finally, there is an exploration site on Baffin Island near the shores of Fury and Hecla Strait a few miles north of Igloolik. Each of these areas will be discussed in turn.

In the area of Baker Lake and Dubawnt Lake, vigorous uranium exploration activity has been carried out for the past several years. Major national and international mining concerns have completed extensive exploration programs in the area (9,10). These companies include Urangesellschaft, Pan Ocean Oil, Noranda, BP Minerals, Essex Minerals, Marline Oil, Western Mines, and Cominco. Other companies have had smaller exploration programs. Several significant uranium deposits have been discovered. The potential to discover and define additional uranium mineralization is considered high. The perceived impact of this high level of mineral exploration on the caribou resource gave rise to a celebrated court case in which the people of Baker Lake attempted to halt uranium exploration.

Near Bathurst Inlet, Cominco has been active in exploration and drilling at three sites (11).

In the area near Coppermine, extensive exploration programs have been carried out by BP Minerals, Cominco, and Gulf Minerals (12). Reconnaissance and smaller exploration programs have also been carried out by Eldorado Nuclear, Uranerz, Hudson's Bay Oil and Gas, and Esso Resources.

An isolated site in the area of the Strait of Fury and Hecla has been held by Dejour Mining Limited (13). An active program was carried out in 1980 and is expected to continue in 1981. The community nearest this activity is Igloolik.

Petroleum

Oil and gas have not been produced from the ITC area in the past. However, the potential for future production has caught the attention of the oil industry and the public alike. It has been estimated that Canadian frontier basins north of the 60th parallel contain up to 50 percent of all the potential oil and gas resources remaining in Canada.[3] It is scarcely surprising that estimates of this magnitude have led to intensive exploration efforts. Three exploration areas are active in the Arctic. Significant reserves of oil and gas have been demonstrated in the Mackenzie Delta/Beaufort Sea district. In addition, a number of wells have demonstrated the presence of large gas deposits in the Arctic Islands, with recent indications that oil may also be present. Finally, geophysical exploration and a more modest amount of drilling have shown promising results in the eastern offshore. Each of these regions will be discussed briefly in turn.

In the Mackenzie Delta and Beaufort Sea, exploration spending is running at or above $200 million annually (14). Esso Resources has a long history of interest in the Beaufort and has developed the technology of drilling from artificial islands in shallow water. Esso's most recent venture on the Beaufort was a $65-million program in cooperation with Gulf Canada, Aquitaine, Norcen and Brascan.

Dome Petroleum Limited, through its subsidiary Canmar, spent $140 million in the Beaufort Sea in 1978 and $160-$170 million in 1979. Dome's partners have included Gulf Canada, the Hunt interests, Columbia, Mobil, Aquitaine, Brascan, and Norcen. Dome's investment in vessels and facilities is said to exceed $300 million. Some estimates of Dome's spending in the next decade range up to $40 billion.

In view of the large scale and long duration of exploration activities in the Beaufort, it will be interesting to learn more about the impact which has been experienced by local communities and the mechanisms which they have developed for coping with the potential disruptions. Whereas the Beaufort is in the area covered by the COPE claim, we think the lessons will be useful in studying the ITC claim and its implications.

In the high Arctic, Panarctic Oils Limited has for a number of years managed an extensive drilling program on behalf of itself, its parent companies, and other participants (15). Major gas discoveries have been made and drilling continues

3. Lancaster Sound Regional Study, Backgound Report IV, by S.A. Kanik, page 9.

to confirm the size of the resource. Several competing transportation systems for the gas have been proposed. Two of these will be discussed later in this paper. It appears that the commercial production of gas from the high Arctic is a real possibility in the next decade.

Petroleum exploration in the eastern offshore is less far advanced. Seismic and other exploratory work has been carried out in the Lancaster Sound region and elsewhere. Considerable territory is held under oil and gas permits by individual companies and consortia representing most of the major natural resource companies operating in Canada. Drilling in a number of the areas of interest has been held up until the environmental impact has been more carefully assessed. One well has been drilled in the Davis Strait, 80 miles north of the tip of Labrador and south-east of Frobisher Bay (16). This was the Hekja well, a joint venture between Petro-Canada and Aquitaine. Esso and Aquitaine are involved in a joint venture for the drilling of one or more wells in the Davis Strait near Cape Dyer (17). Major exploration programs in the Lancaster Sound region are pending governmental approval, and are the subject of extensive study at present (18).

It has been noted that most of the major Canadian and multinational resource companies are active to some degree in northern petroleum exploration. Some, such as Dome, Esso, Panarctic, and Aquitaine are operators, whereas other companies are partners in joint ventures, without operating responsibility. One of the most significant actors for the future will undoubtedly be Petro-Canada. Not only is this Crown corporation a major participant in the Panarctic consortium, but it is also providing funds for joint ventures managed by others. Perhaps the most significant change for the future, however, will be that Petro-Canada will have the right to participate in exploration and development programs initiated by others under the terms of the new National Energy Policy. To the extent that the policies and decisions of this corporation differ from those of corporations in the private sector, they will have a unique impact on the direction of petroleum development in the north.

Mineral Processing

It is legitimate to explore the extent to which mineral resources will be upgraded or processed in the ITC claim area. Processing may take several forms depending on the nature of the particular mineral. For example, precious metal ores, being very dilute, must invariably be concentrated at or near the mine site before being transported long distances. The resulting product is high in value compared with its bulk, and may be shipped in that form without further

refining. Similarily, base metal ores will in all likelihood be concentrated in a 'mill' or concentrator, before shipment. As base metal concentrates are commodities which can enter world trade directly, it is unlikely that processing beyond the concentrate stage will be undertaken in the ITC area for the foreseeable future. The next stage, smelting and refining, is usually carried out for economic reasons in industrialized areas, where access to a large labour pool, electric power, repair services, and ultimate metal markets is assured.

For uranium, mined ores are normally concentrated at the mine site to a product called 'yellow cake'. The yellow cake is then transported to a central uranium refinery. If the grade of ore is sufficiently high, it is possible that the concentration stage may be omitted. We would expect most uranium operations eventually developed in the ITC claim area to be equipped with concentrators, but we would not expect uranium refining facilities to be built in the foreseeable future.

Crude oil must be refined before it can be used by the consumer. Oil refineries are commonly located near the consuming market for economic reasons. Thus, it may be expected that any crude oil produced in the ITC claim area will be shipped as crude oil to more populated areas. Conversely, natural gas requires little processing before it is consumed. Sulphur and condensable hydrocarbons are commonly removed before the gas is transported, but little else is required. Modest processing facilities may well be associated with Arctic gathering and transmission stations for natural gas. In addition, as part of one of the transportation systems to be discussed below, it is proposed that a gas liquefaction plant be located on Melville Island.

In summary, the above discussion indicates that the scope for processing of mineral commodities will be rather limited, and that the major industrial activities related to nonrenewable resources will, for many years, be associated with the exploration and production stages.

Mineral Transportation

Even though a mine or producing oil well may be distant from a particular community, the effect of transporting large quantities of nonrenewable resources may be to spread the effects of industrialization through a much wider area in the north. In discussing transportation, we will limit ourselves to the transport of mineral products (including petroleum), ignoring the passenger traffic and other support activities which will be occasioned by

development of particular industries. These support activies may very well have substantial impacts on particular communities which act as staging areas. However, the prediction of such traffic patterns is outside the scope of the present paper. The transport of hard minerals will be considered first, followed by proposals which have been made for the transportation of crude oil and of natural gas.

Hard Minerals

Base metal concentrates are already shipped from the Nanisivik mine in ice-strengthened vessels during the short period of open water each summer. This pattern is made possible by the fact that total volume of concentrate is such that it can be stored for several months of the year. Storage, while it represents an additional economic cost to the mine operator, is physically feasible.

The Polaris Mine on Little Cornwallis Island proposes to follow a similar pattern of prolonged storage followed by shipping during a few weeks each year (19). Unfortunately, the open period is variable at Little Cornwallis Island and on some occasions shipment of all, or even a part, of the year's production may not be possible. Transportation therefore represents an additional source of uncertainty for the development of Arctic mineral deposits.

If viable base metal deposits are developed inland from Coppermine or from Eskimo Point, their exploitation will depend on the construction of a road or rail link which will permit shipment of concentrate. It is too early to say whether these deposits will justify the expense of such transportation infrastructure, but it can be assumed that the technical problems would be substantial and the costs proportional.

The impact of ocean transport of base metals on the natural environment and on the native people is limited by the fact that such shipments are constrained to take place over a short period in the year at a time when the water is open. There is no reason to suppose that a major impact will result. For overland transportation, the major effect of a road or railway may be to open up a region for multiple uses. Significant changes may result on a local level.

Similar considerations apply to the transportation of precious metal concentrates and uranium concentrates. Because of the high value/low bulk characteristics of both commodities, transportation by air can be considered.

In special cases surface transportation may be cheaper, but even where this mode is adopted the quantities to be shipped will be moderate and the impacts correspondingly small. It is doubtful that dedicated roads or railways would be justified by the shipment of concentrates of precious metals or uranium.

Crude Oil

The situation with crude oil is markedly different. If crude oil is produced on a commercial basis in the north, assured outlets will be required, and transportation must take place at all seasons of the year. The transportation systems that have been considered include both pipelines and shipment by ice-breaking tankers. Shipment of oil by pipeline presents certain technical problems in connection with permafrost. Moreover, the construction of the pipeline itself has been considered by some to be a disruptive activity. On the other hand, ice-breaking tankers may be constructed in industrial Canada and the loading terminal may be isolated from most native communities. Nevertheless, the transport of large quantities of crude oil by frequent tanker sailings at all seasons of the year could present its own technical challenges and create some substantial impacts. Care would have to be taken to ensure that oil spills did not occur in Arctic waters, and the maintenance of ice-free shipping lanes might disturb existing patterns of animal migrations and hunters' movements that now exist during the winter season.

If the oil in question were produced in the Beaufort Sea, the tanker routes would be through the Northwest Passage or through the Bering Strait, with the former considered more likely (20). Production of oil in the eastern offshore would present simpler problems from a transportation viewpoint.

Natural Gas

According to conventional technology, natural gas is transported almost exclusively by pipeline. For natural gas produced in the Beaufort Sea/Mackenzie Delta region, the Alaska Highway and Dempster pipeline routes would scarcely affect the ITC claim area. However, an alternative proposal (considered unlikely of approval) takes a route east of Inuvik towards Coppermine. Skirting Great Bear Lake and Great Slave Lake to the north and east, the pipeline would cross the 60th parallel near the Saskatchewan/Manitoba border (22).

For gas produced in the Arctic islands, two principal alternatives are under consideration.

i The Polar Gas Pipeline Proposal: Under this scheme a gas-gathering system in the central Arctic Islands would feed the gas to a pipeline proceeding from Melville Island across Viscount Melville Sound and across Victoria Island (23). Near Coppermine, the Polar Gas Pipeline would join the gas pipeline which had originated in the Mackenzie Delta, and the combined flows would proceed in a southeasterly direction. Naturally, this proposal assumes that the Mackenzie/Beaufort pipeline would be built across the NWT, perhaps not a very likely prospect. The Polar Gas line, if it is built, could affect people living in Read Island, Holman Island, Cambridge Bay, and Coppermine.

ii The Arctic Pilot Project: This project is sponsored by Petro-Canada, in conjunction with Nova, Dome, and Melville Shipping Limited. Hearings were recently conducted on the proposal. This project comprises a gas-gathering system on Melville Island, feeding a natural gas liquefaction plant on the south shore of that island. Liquefied natural gas would be shipped in tankers from the liquefaction plant to southern Canada on a year-round basis. The estimated capital cost would be $1.5 to $2.0 billion to ship an average of 250 million standard cubic feet per day. The shipping route would follow Viscount Melville Sound, Barrow Strait, and Lancaster Sound into Baffin Bay (21). Year-round shipping would have significant implications for the communities in the vicinity of the shipping routes. Although employment opportunities might be created, some adverse environmental effects have also been predicted.

The above discussion, brief as it is, does indicate that the transportation of nonrenewable resources (particularly petroleum) may be expected to have implications far beyond those at the point of production. These implications will need to be carefully assessed in the ultimate design which is adopted for transportation systems.

4. INDUSTRIAL DEVELOPMENT ISSUES

As the Eastern Arctic Study proceeds, we expect to develop a more complete understanding of the issues that face various decision makers as they attempt to resolve the Inuit land claim. The following discussion, therefore, simply poses a few of the more obvious issues and discusses each one briefly.

Motivations for Northern Development

It is natural that different actors seek different benefits from industrial development. The private investor seeks an adequate rate of return, commensurate with the project risk and recovery of costs sunk in earlier exploration. Local communities look for employment opportunities, development of improved infrastructure, participation in decision making, increasing levels of income and services, and business opportunities for local entrepreneurs. Governments consider matters such as enhancement of Canadian sovereignty, improvement in the Canadian balance of payments, contribution to the national economy, development of indigenous technology, and increased resource revenues.

At the same time, all parties are conscious of risks which can arise from industrial development: for the investor, economic loss; for the community, social disruption and lessening of opportunities for traditional pursuits; for government, political risk. It is obvious that few projects can satisfy all the desires of all the actors. A process of resolution and accommodation must therefore accompany the development of northern industries. The institutions which are put in place as a result of land claim settlement, constitutional development, or other evolutionary changes must be designed to facilitate the necessary accommodations.

Impact of Industrial Development

Every major development has both a physical and a social impact. While some actors welcome change and look for an improved situation arising out of industrial development, others are dubious at best about the proclaimed benefits. Reliable information and projections of the impact of a particular development are difficult to make and the impact studies are not always accurate. The art or science of foretelling the future is not very reliable. Difficulties inherent in the estimatation of future events are compounded when the parties

suffer under the burden of imperfect communication and information. Misconceptions, based on faulty information and fear of the unknown, can lead to extra difficulty in resolving such difficulties as do arise.

Design of the Industrial Development

It is unlikely that a project which is designed in accordance with southern standards will be very satisfactory in meeting the special requirements of the north. Environmental and waste management practices which are adequate in the southern situation may lead to special difficulties in the north. To maximize local benefits it will be necessary to use local manpower where possible and to stimulate local suppliers and entrepreneurs. The resulting design changes may have more or less severe cost implications for the project. Added costs and risks raise the profitability hurdle which projects must surmount. In other words, quite independent of extra costs imposed by the climate and geographical isolation, the modifications required to meet northern social standards may simply make some otherwise viable projects marginal or sub-marginal. On the other hand, projects of outstanding profitability may serve as vehicles for the progressive satisfaction of industrial, social, and governmental goals.

Regulatory Process and Structure

As a result of the settlement of land claims, it is more than likely that control of land use in one form or another will be decentralized or delegated to local agencies. To the extent that decisions as to approval and regulation were made centrally in Ottawa in the past, developers felt that they could deal with a defined decision structure and obtain answers to their questions and applications. At the same time, however, local councils and individuals have felt that they do not have enough influence on industrial decisions which may drastically alter the way of life in the community.

A whole spectrum of changes can be visualized in which the process of local consultation is strengthened as a first step, or in which local authorities are given decision-making control over restricted areas or even over much larger areas surrounding their communities. As the degree of local control is increased, a series of questions becomes more and more pressing.

- How will the local decision authorities ensure that their standards and requirements are comparable to those established elsewhere in the Northwest Territories? Elsewhere in Canada and in the world?

- How will the local authorities develop enough expertise in the economics of the different industries so that they can evaluate the effects of any particular regulation method?
- How will potential developers deal with local authorities? Will they attempt to explain their proposals fully and patiently, or will they seek to bypass the local authorities in favour of a higher (perhaps a more 'sophisticated') level of government?

Resource Revenues

It is widely held that natural resources can be expected to yield an 'economic rent' to the owner of the resource (usually considered to be the public). In southern Canada the provinces collect mineral royalties and taxes, whereas in the northern territories the federal government has made such levies. As a result of the land claims, ownership and control of resources may be delegated to native peoples and/or to local authorities.

- How will raising of resource revenues be handled?
- Will the revenues be collected on a uniform scale and redistributed to all residents in the territory?
- Will local authorities collect revenues and apply them primarily to local needs?
- Will some resources be treated differently than others? For example, it has been indicated that the ITC does not intend to claim proprietary rights to oil and gas. Will the same position be taken with respect to hard minerals?
- It has been demonstrated that a given level of resource revenue may be collected by schemes of different designs. However, each method of taxation has a different effect on the economic incentives remaining to the investor. As a result, each method shapes development in a certain way. Will the taxing authorities have the expertise to analyze the effects of a proposed scheme for collecting resource rents in order to ensure that it does not have undesirable side-effects?

Participation by Local People in Resource Development

In many parts of the world the history of 'enclave' development has not been a happy one. Nothing much is gained for the local community when an industrial development is financed with outside money, built with outside labour, operated by outsiders, and when the product is shipped to outside markets. In these circumstances the community is likely to be exposed to most of the risks without participating fully in the benefits.

To a large degree it has become accepted among industrial developers that every opportunity should be given to northern residents to participate in northern projects. Satisfactory participation does, however, call for a high level of skill and understanding on the part of the developer and a willingness on the part of the community members to adapt in some degree to new conditions.

Not every local person wishes to work in a mine or on a drilling rig. Nevertheless, the community as a whole may feel that it would like to participate in the ownership and direction of the development even though the industry may be operated, for a time at least, by outside personnel. How is such ownership participation to be arranged? Is a share of the profits to take the place of resource revenues? Is the local community entitled to participate in the ownership at no cost to itself? If so, who should contribute the community's share of equity: the developer or the federal government?

Implications for Development Decisions

Decisions on all of the above points, and the mechanism by which such decisions are reached, can vitally affect the speed and direction of development. There are physical implications, in that development projects may be designed differently in response to constraints imposed. There are also financial implications. Depending on the way the various questions are resolved, the profitability of individual developments may be changed quite dramatically. Even if the overall profitability remains adequate, the distribution of costs and revenues, as well as the financial structure of the development, will vary.

Finally, there are psychological or additudinal implications. It is known that natural resource capital is mobile. That is, the readiness of experienced natural resource companies to invest in a particular region, or indeed in a particular country, depends quite strongly on the perceived stability and fairness with which regulations and taxation are administered. If a particular deposit is highly profitable, it may be developed in spite of adverse 'political' risk. More marginal deposits, however, may be deferred or abandoned if conditions are not perceived to be favourable. The possibility of missing some development that would otherwise be beneficial cannot therefore be discounted.

It does appear that the best hope for a pattern of industrial development which serves the needs of both the Inuit people and the Canadian economy lies in intensive effort on both sides to communicate with and understand the constraints and requirements of the other party.

We hope that the Eastern Arctic Study will contribute in some small way to the mutual understanding which will be so necessary for the resolution of these matters.

APPENDIX I: INDUSTRIAL DEVELOPMENTS: LOCATION

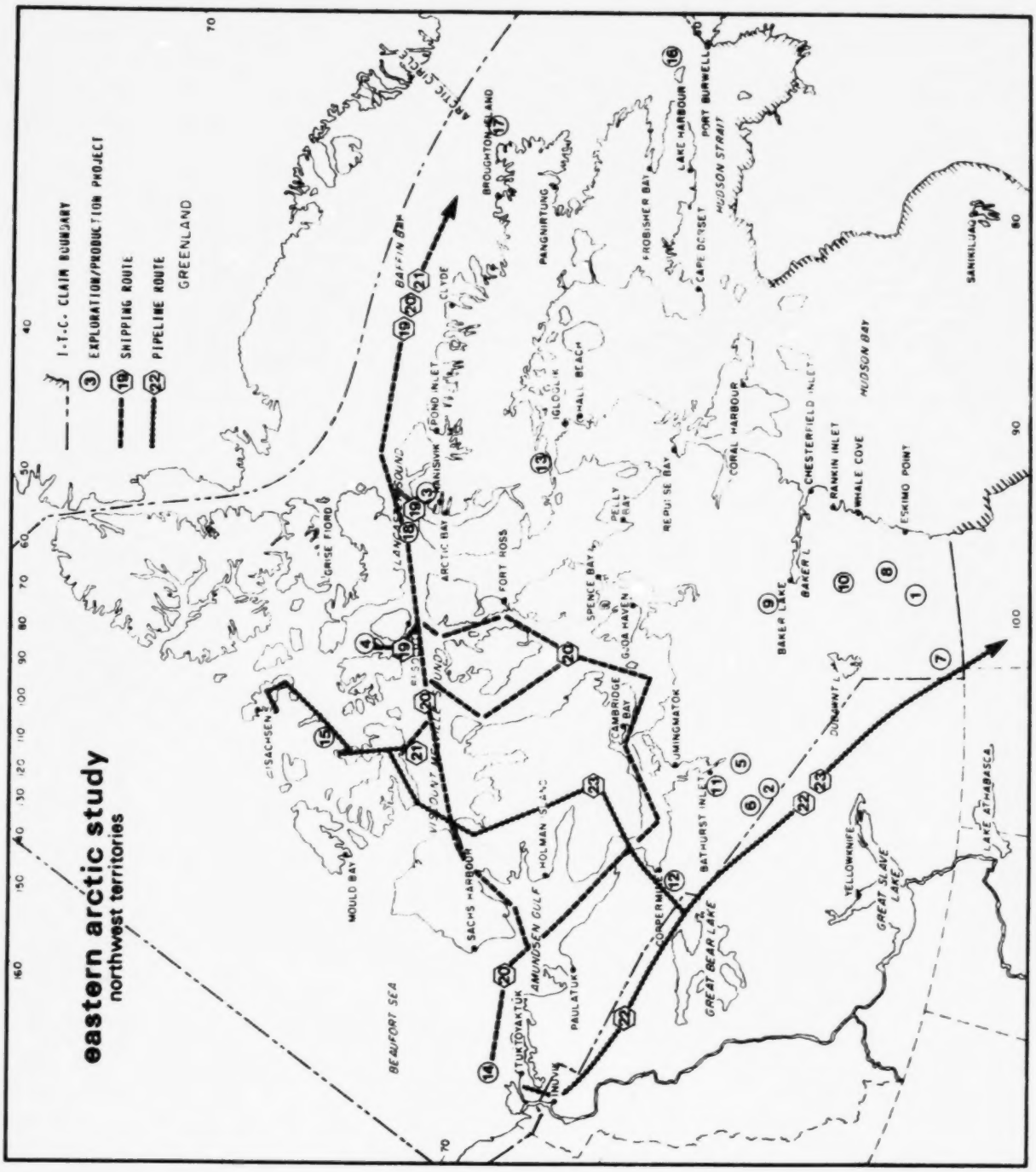

Figure 1. Approximate location of existing and potential industrial developments in the ITC claim area

APPENDIX II

INDUSTRY/COMMUNITY INTERACTIONS
(Reference Numbers are as Used in Text, Chapter 3)

Community	Exploration and Production				Transportation		
	Precious Metals	Nonferrous Metals	Uranium	Oil and Gas	Minerals	Oil	Gas
Arctic Bay		3		18	19	20	21
Baker Lake			9,10				
Bathurst Inlet	2	5	11		a	20	
Broughton Island				17		20	
Cambridge Bay						20	23
Cape Dorset							
Chesterfield Inlet			10				
Clyde River						20	
Coppermine			12			20	23
Coral Harbour							
Eskimo Point	1	7			a		
Fort Ross			b			20	
Frobisher Bay				16			
Gjoa Haven						20	
Grise Fiord							
Hall Beach			13				
Holman Island						20	23
Igloolik			13				
Isachsen				15			21,23
Lake Harbour				16			
Mould Bay				15		20	
Nanisivik		3		18	19	20	
Pangnirtung				17		20	
Paulatuk						20	
Pelly Bay							
Pond Inlet		3		18	19	20	21
Port Burwell				16		20	
Rankin Inlet		c	10		a		
Repulse Bay							
Resolute		4	b	15	19	20	21
Sachs Harbour				14		20	
Sanikiluaq							
Spence Bay							
Tuktoyaktuk				14		20	
Umingmatok	2	5	11		a	20	
Whale Cove		8	10				

Notes:
a. Refers to local effects of potential transport of base metal concentrates.
b. Indications of uranium activity on Prince of Wales Island.
c. Refers to past exposure to nickel mining operation.

THE AUTHOR

C. George Miller was born in Winnipeg in 1932. He holds degrees in Engineering and Chemistry from Queen's University and Oxford University. Following a post-doctoral fellowship at the National Research Council, he spent two years in a tobacco research laboratory. In 1960, Dr. Miller joined Celanese Canada Ltd., where he held a number of technical and management posts including managing director of Chemicell S.A. (Switzerland) and general manager, chemicals. In 1972, he became vice-present of Stanley Associates Engineering Ltd., Edmonton. He was appointed executive director of the Centre for Resource Studies in 1974. A professional engineer, Dr. Miller is also a member of the Canadian Institute of Mining and Metallurgy and a Fellow of the Chemical Institute of Canada.

EASTERN ARCTIC STUDY

The Centre for Resource Studies and the Institute of Local Government, both of Queen's University in Kingston, Ontario, are undertaking a study of the ways in which the land claim of the Inuit Tapirisat of Canada (ITC) may affect local government and mineral development in the Northwest Territories (NWT). Financial support for the study is being provided by an independent agency, the Donner Canadian Foundation. Advisory support is being provided by the ITC, the the federal government, the Government of the Northwest Territories, and many other agencies, companies and interested groups.

The objectives of the Eastern Arctic Study include the following:

1. to study the potential impact of the settlement of ITC land claims, and of constitutional development in the NWT, on local government in the ITC area;

2. to study the potential impact of these changes on mineral development (including both petroleum and mining) in the ITC claim area.

3. to present the results of this research in a manner which will permit its use by northerners and other interested parties to anticipate possible difficulties and mitigate their effects.

Local government is extremely important to the residents of the Northwest Territories, because local councils and committees provide services that are basic to everyday needs. In addition, a community's local government can often act as the interpreter and advocate of peoples' interests and needs.

We expect the land claim negotiations to result in two related outcomes.

i Local governments will be given increased responsibilities in the land claim area. Some changes are already in progress, chiefly through the initiative of the communities themselves and of the Government of the Northwest Territories. ITC also supports stong local government. The phrase 'local government' refers to any governing authority established below the territorial level. It could include, for example, regional governments as well as hamlet or settlement councils and their committees.

ii There will be a significant increase in the degree of influence exerted by local governments, and by native institutions such as development corporations and cooperatives, on resource planning and the mineral development process.

Thus we expect the settlement of claims to affect significantly the climate for mineral development in the NWT. Native people will have strengthened local governments and an expanded role in planning the nature and direction of resource development.

The possibilities for mineral development in the ITC claim area are substantial, and the future of resource development in this region has implications for the welfare of all northerners, and for all Canada. It is therefore important that all parties to the negotiating process understand the possible consequences of their decisions and actions. The purpose of this study is to contribute to that understanding.

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POOR

QUALITY

ORIGINAL